

Claims

1. A transfer case for a four wheel drive vehicle, having an automatic transmission with an output shaft, the transfer case adapted to mount to the transmission and comprising:

a planetary gear set drivable by the transmission output shaft and having a sun gear, a planet gear carrier assembly, and a ring gear;

a first clutch operatively engaging the planetary gear set, with the first clutch engagable and disengagable by changes in pressure of a hydraulic fluid;

a second clutch operatively engaging the planetary gear set, with the second clutch engagable and disengagable by changes in pressure of the hydraulic fluid;

a primary output device drivable by the planetary gear set;

a secondary output device; and

a third clutch operatively engaging the primary output device and the secondary output device, with the third clutch engagable and disengagable by changes in pressure of the hydraulic fluid to thereby selectively couple and decouple the secondary output device to the primary output device.

2. The transfer case of claim 1 wherein the first clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the first clutch and disengagable by reducing the hydraulic pressure to the first clutch.

3. The transfer case of claim 2 further including a first hydraulic fluid passage having a first end operatively engaging the first clutch and a second end adapted to operatively engage a hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the first clutch is suppliable by the transmission.

4. The transfer case of claim 1 wherein the second clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the second clutch and disengagable by reducing the hydraulic pressure to the second clutch.

5. The transfer case of claim 4 further including a first hydraulic fluid passage having a first end operatively engaging the second clutch and a second end adapted to operatively engage a hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the second clutch is suppliable by the transmission.

6. The transfer case of claim 1 wherein the third clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the third clutch and disengagable by reducing the hydraulic pressure to the third clutch.

7. The transfer case of claim 6 further including a first hydraulic fluid passage having a first end operatively engaging the third clutch and a second end adapted to operatively engage a hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the third clutch is suppliable by the transmission.

8. The transfer case of claim 1 wherein the first clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the first clutch and disengagable by reducing the hydraulic pressure to the first clutch; the second clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the second clutch and disengagable by reducing the hydraulic pressure to the second clutch; and the third clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the third clutch and disengagable by reducing the hydraulic pressure to the third clutch.

9. The transfer case of claim 8 further including a first hydraulic fluid passage having a first end operatively engaging the first clutch and a second end adapted to operatively engage a first hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the first clutch is suppliable by the transmission; a second hydraulic fluid passage having a first end operatively engaging the second clutch and a second end adapted to

operatively engage a second hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the second clutch is suppliable by the transmission; and a third hydraulic fluid passage having a first end operatively engaging the third clutch and a second end adapted to operatively engage a third hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the third clutch is suppliable by the transmission.

10. The transfer case of claim 1 wherein the first clutch is a high range clutch and is coupled to the planetary gear set such that, when the first clutch is engaged, an output of the planetary gear set is at about a 1:1 ratio with an input to the planetary gear set.

11. The transfer case of claim 1 wherein the second clutch is a low range clutch and is coupled to the planetary gear set such that, when the second clutch is engaged, an output of the planetary gear set is at a reduced rotational output ratio to an input to the planetary gear set.

12. A transfer case for a four wheel drive vehicle, having an automatic transmission with an output shaft, the transfer case adapted to mount to the transmission and comprising:

planetary gear set drivable by the transmission output shaft and having a sun gear, a planet gear carrier assembly, and a ring gear;

a first multi-plate hydraulic clutch operatively engaging the planetary gear set, with the first clutch engagable and disengagable by changes in pressure of a hydraulic fluid, and with the first clutch being a high range clutch that is coupled to the planetary gear set such that, when the first clutch is engaged, an output of the planetary gear set is at about a 1:1 ratio with an input to the planetary gear set;

a second multi-plate hydraulic clutch operatively engaging the planetary gear set, with the second clutch engagable and disengagable by changes in pressure of the hydraulic fluid, and with the second clutch being a low range clutch that is coupled to the planetary gear set such that, when the second clutch

is engaged, an output of the planetary gear set is at a reduced rotational output ratio to an input to the planetary gear set;

a primary output device drivable by the planetary gear set;

a secondary output device; and

a third multi-plate hydraulic clutch operatively engaging the primary output device and the secondary output device, with the third clutch engagable and disengagable by changes in pressure of the hydraulic fluid to thereby selectively couple and decouple the secondary output device to the primary output device.

13. The transfer case of claim 12 further including a first hydraulic fluid passage having a first end operatively engaging the first clutch and a second end adapted to operatively engage a first hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the first clutch is suppliable by the transmission; a second hydraulic fluid passage having a first end operatively engaging the second clutch and a second end adapted to operatively engage a second hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the second clutch is suppliable by the transmission; and a third hydraulic fluid passage having a first end operatively engaging the third clutch and a second end adapted to operatively engage a third hydraulic fluid passage in the transmission whereby the hydraulic fluid pressure employed to engage and disengage the third clutch is suppliable by the transmission.

14. A drivetrain for a four wheel drive vehicle comprising:

an automatic transmission having a transmission input and a transmission output shaft; and

a transfer case mounted to the transmission having a planetary gear set coupled to the transmission output shaft and having a sun gear, a planet gear carrier assembly, and a ring gear; a first clutch operatively engaging the planetary gear set, with the first clutch engagable and disengagable by changes in pressure of a hydraulic fluid; a second clutch operatively engaging the planetary gear set,

with the second clutch engagable and disengagable by changes in pressure of the hydraulic fluid; a primary output device drivable by the planetary gear set; a secondary output device; and a third clutch operatively engaging the primary output device and the secondary output device, with the third clutch engagable and disengagable by changes in pressure of the hydraulic fluid to thereby selectively couple and decouple the secondary output device to the primary output device.

15. The drivetrain of claim 14 wherein the transfer case includes a first transfer case fluid passage having a first end operatively engaging the first clutch and a second end, and the transmission further includes a valve body with at least three control valves, and a first transmission fluid passage having a first end in communication with a first one of the at least three control valves and a second end in fluid communication with the second end of the transfer case fluid passage, whereby the hydraulic fluid pressure selectively employed to engage and disengage the first clutch is supplied by the first one of the at least three control valves in the transmission.

16. The drivetrain of claim 15 wherein the transfer case includes a second transfer case fluid passage having a first end operatively engaging the second clutch and a second end, and the transmission further includes a second transmission fluid passage having a first end in communication with a second one of the at least three control valves and a second end in fluid communication with the second end of the second transfer case fluid passage, whereby the hydraulic fluid pressure selectively employed to engage and disengage the second clutch is supplied by the second one of the at least three control valves in the transmission.

17. The drivetrain of claim 16 wherein the transfer case includes a third transfer case fluid passage having a first end operatively engaging the third clutch and a second end, and the transmission further includes a third transmission fluid passage having a first end in communication with a third one of the at least three

control valves and a second end in fluid communication with the second end of the third transfer case fluid passage, whereby the hydraulic fluid pressure selectively employed to engage and disengage the third clutch is supplied by the third one of the at least three control valves in the transmission.

18. The drivetrain of claim 17 wherein the first clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the first clutch and disengagable by reducing the hydraulic pressure to the first clutch; the second clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the second clutch and disengagable by reducing the hydraulic pressure to the second clutch; and the third clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the third clutch and disengagable by reducing the hydraulic pressure to the third clutch.

19. The drivetrain of claim 14 wherein the first clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the first clutch and disengagable by reducing the hydraulic pressure to the first clutch; the second clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the second clutch and disengagable by reducing the hydraulic pressure to the second clutch; and the third clutch is a multi-plate hydraulic clutch, engagable by increasing a hydraulic pressure to the third clutch and disengagable by reducing the hydraulic pressure to the third clutch.

20. The drivetrain of claim 14 wherein the transmission includes three planetary gear sets for selectively transmitting torque from the transmission input to the transmission output.